DOCUMENT RESUME

ED 093 347 IR 000 834

AUTHOR	Cornelius, John
TITLE	Summary of Remarks at EDUCOM Fall Conference 1973.
INSTITUTION	California Univ., San Diego.
PUB DATE	Oct 73
NOTE	6p.; Paper presented at the EDUCOM Fall Conference (Princeton, New Jersey, October 1973)
AVAILABLE FROM	"Facts and Futures: What's Happening Now in Computing for Higher Education", Proceedings of the Fall 1973 EDUCOM Conference; EDUCOM, P. O. Box 364, Princeton, New Jersey 08540 ($9.00)
EDRS PRICE	MF-$0.75 HC-$1.50 PLUS POSTAGE
DESCRIPTORS	Chemistry; *College Faculty; *Computer Programs; *Computers; Computer Science; *Facility Guidelines
IDENTIFIERS	Computation Centers; *University of California at San Diego

ABSTRACT

The Chemistry Department at the University of California, San Diego, has 35 members, 20 of whom are experimentalists with either computers or plans to acquire one. Within the department there are turn-key systems connected to mini-computers or the department computer, an IBM 1800. There is little control over computers in the department and little standardization. The campus computer center is in debt, and there is political pressure to make greater use of this center. With a short supply of research dollars, it is important to utilize local existing facilities to the greatest extent efficiency allows. The objectives to be achieved are to promote the innovative use of computers in chemistry, to enhance turn-key systems to greater capabilities, to provide a consistent level of systems support--both with hardware and software, and to utilize the campus computer center whenever possible. (WH)

John Cornelius
University of California, San Diego

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

SUMMARY OF REMARKS AT EDUCOM FALL CONFERENCE 1973

At the outset I'd like to discuss the environment in which we operate because I feel an understanding of that environment is essential to an understanding of the approaches that we have taken towards solving a number of fairly common data processing problems.

We are a Chemistry Dept. with about 35 faculty members of whom approximately 20 are experimentalists. Most of those 20 are either now acquiring computers, have one, or are asking for funds to acquire one. Each of the individual computers within the department can be justified in terms of the scientific mission of the various principle investigators. Sheer weight of numbers dictates that the departments commitment to automatic data processing in the laboratory and in subsequent data reduction is substantial.

In laboratories we have a number to turn-key systems integrated into instruments such as NMRs and spectrometers as well as approximately half a dozen ad hoc laborstory systems that the department has built around either mini computers or a departmental computer, an IBM 1800, which we have had for about 5 years. We anticipate approximately 8 additional mini computers in the department in the next two or three years. Many of these will be turn-key systems included as part of an instrument and can be acquired at a price which is extremely competitive with alternative schemes such as utilizing the departments IBM 1800 or some existing mini computer. Several others will be home grown systems built around mini computers and will be dedicated to specific tasks for which there are no existing turn-key systems. As a result the department exerts little or no control over an investigator who wishes to acquire a computer.

A byppoduct of this lack of control is that there is no standard mini computer in our department. This is unlike the approach taken by many computer

John Cornelius
University of California, San Diego

centers, computer science departments, and chemistry departments. Incidently, we do not view this situation as being particularly bad. Although standardizing on a mini computer or all mini computer applications in a department or within a university campus provides for technical expedience it is frequently extremely unpopular and presents many political barriers to fulfillment of the service function.

We also have a campus computer center which is in debt. It is my understanding that this is not an uncommon situation in the university environment. The indebtness by our campus computer center and the campus' commitment to that computer center, because of financial constraints within the university, produce some interesting side effects both politically and scientifically. Decisions regarding acquisition of a computer for noncomputer research use by an individual investigator are made on a political basis rather than on the merits of the problem or a particular machine that might be available.

Research dollars are becoming more and more difficult to get. In many areas basic research is not being funded where more productive service type science is being funded. This is especially true in disciplines which can provide services and solutions in such fields as cancer and air pollution. Research proposals are being written for smaller and smaller amounts and the funding process is considerably more competitive than five years ago. This means that investigators have to take advantage of as many existing capabilities as possible in order to achieve funding of a proposal.

The objectives that we set for our own research into utilization of mini computers are pretty simple and straight forward. They are addressed right to the problems, money and the capability that you can buy with it.

Our first objective is to promote innovative use of computers and advance the state of the art in our primary area of interest which is chemistry.

Secondly we want to enhance turn-key systems beyond the capabilities that are normally delivered by the manufacturer. The turn-key system normally goes for around $15,000 to $20,000. That's a fairly common price and it usually lacks, at that price, adequate peripherals to do some fairly germain things, like compilations, assemblies, link editing and loading of object programs. In order to have the proper peripherals for accomplishing these things you can double or quadruple in some cases the cost of the mini computer system you bought as part of your spectrometer which was fairly cheap in the first place.

Third we'd like to provide a consistant level of systems support both in hardware and software and we'd like to do this for all the different kinds of mini computers that we find in our department.

Fourth we would like to utilize the campus computer center whenever possible because it alliviates a lot of the pressures which could be put on us to spend all of our money at the computer center. We would like to make that use easy and natural for the investigator since, when there is no argument regarding what computer to use, it may as well be easy and simple for the investigator to use it. On the other hand we don't promote the use of the campus computer center in several areas. There are many instances where the campus center is simply not economical. We don't promote the use of money in an unreasonable way since there is not enough of it. In areas where the computer center is unsympathetic they don't promote the use of the campus computer center and where expertise and programs clearly reside elsewhere we take advantage of that expertise. Parenthetically it

John Cornelius
University of California, San Diego

should be noted that the bulk of support software that comes from mini computers is written for IBM 360s. At our own campus computer center we have a Burroughs 6700. Since there are a number of 360s on the ARPANET and the campus is on the ARPANET we utilize the remote computers by the ARPANET wherever it is reasonable to do so.

The whole point of our existence is to provide maximum benefit possible for the investigators equipment and computing dollar. The specific actions that we've taken to meet the objectives outlined are very straight forward in nature and well within the state of the art. We have made no effort to advance the state of the art in computer science in this work since the existing technology is adequate to provide the prerequisite hardware and software.

Any system which interconnects computers requires a great deal of interfacing effort. We're quite lazy at San Diego so that the very first action that we have taken is to adopt a standard hardware interface unit which will provide relatively simple protocals for user and system hardware. As it turns out there is a data processing standard for computer interfaces. The standard is CAMAC and it has the advantage that it is not tied to any single manufacturer of main frames or peripheral devices. Essentially this standard is itself a peripheral device which serves to multiplex large numbers of peripheral units with widely divergent data transfer requirements into a single central processor.

Since the protocals in CAMAC are simple our facility can utilize personnel who are not normally computer science types or even engineers. We have for the past several years been utilizing undergraduates, graduate students and post doctoral fellows who are not normally nimble with integrated circuits and digital design techniques. We believe that this is a decided advantage since the undergraduates, graduate students, and post doctoral fellows are the ones who

John Cornelius
University of California, San Diego

define the problem area and have in mind possibly the best solution to a particular problem. Having the ability to utilize this manpower in a relatively efficient manner is extremely advantageous to us in both the application sense and in the system sense.

CAMAC also reduces significantly the number of interfaces that have to be made to the numerous mini computers in our department. At the moment we have 10 central processors representing 8 different manufacturers and 9 computer types. Using CAMAC allows us to plug things into any of these computers without building a special interface for each computer and each piece of hardware.

Now to hierarchical computing. Utilizing CAMAC we have designed, and partially built, a computer system which provides bulk storage, utility services, peripheral devices, and other types of data processing support to mini computers distributed throughout laboratories in the department. Presently two of the department's mini computers are connected to a central IBM 1800 and utilizing the peripheral devices and disk storage at that site. The two mini computers, a Texas Instruments 980 and a Digital Equipment Corp. PDP 8 access the 30 megabyte disk storage on the IBM 1800 in real time frames and both computers operate under the manufacturer supplied disk operating system. Each disk operating system is modified to the extent that the disk driver software provided by DEC and TI is replaced with our own which assumes the remote disk. So far we have saved approximately $30,000 by not buying disk for these two mini computers and by utilizing disk that we have currently.

Within the next three years we're going to have approximately 20 mini computers connected to a central file system and we anticipate the savings there will be on the order of $200,000.

John Cornelius
University of California, San Diego

As I said the central facility also provides various utilities in the form of peripheral devices, disk management programs, and in some cases remote computing where it is not practical on the mini computer. Many of the peripheral devices which are available at the central facility are interfaced through CAMAC permitting their utilization at the mini computer site if need be.

Interconnecting computers, for whatever reason, can and has been accomplished in just about every way imaginable. Techniques range from the extremely costly to the extremely inexpensive and vary in effectiveness by some random function. Anyone who wants to can connect two computers together and make it do something.

Hierarchical computing has actually been in existance much longer than the communications technology which is made possible the type of hierarchical computing that we are talking about today. The days when punched cards, paper tapes, and magnetic tapes were transferred between computers by manual labor are still with us but are, I hope, disappearing quickly. Hierarchical systems of programs have been in existance since the first days of computing. The advent of today's communications technology permits high speed data transfers between computers and problems but the only thing that has really changed in character is the boundry conditions. Today the turn around time between steps of a hierarchical computing system is several orders of magnitude faster than under manual methods. Nevertheless the systems approaches being taken are the same ones that were taken under the early systems which utilized paper tape data loggers and large batch programs.

We appreciate the assistance of the National Science Foundation and the National Institutes of Health in our research.